REMARKS

Entry of the foregoing and favorable reconsideration and examination of the subject application, as amended, pursuant to and consistent with 37 C.F.R. §1.112, and in the light of the remarks which follow is respectfully requested.

By the present amendment, claim 33 has been amended to correct a typographical error. No new matter has been added via this amendment.

Claims 24 to 37 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Flavell et al. in view of Dodds et al., Taylor or Cumming et al. and further in view of Strack et al., Muller et al., Berglund et al., Harding et al., Moldau, Uotila et al., Chen et al. or Masojidek et al., Chandler et al., Misra et al. or Anandarajah et al.

In making this rejection, the Examiner purports that it would have been obvious to one of ordinary skill in the art at the time the invention was made to measure mitochondrial activity to estimate seed yield, in view of the positive correlation between growth rate, respiration and yield allegedly taught by Flavell et al., using the measure of Dodds et al. (or a modification thereof by obvious parameter optimizations known in the art) whereby the plants of interest where subjected to stress prior to assessing mitochondrial activity in order to more efficiently select the highest

yield, in view of the alleged teaching by Taylor et al. that stress tolerant plants exhibit higher growth rates or by Cumming et al. that stress tolerant plants exhibit a greater respiration rate when exposed to stress. The remainder of the secondary references apparently have been cited in an attempt to provide the teaching for specific stressors.

Applicant respectfully traverses this rejection for the following reasons.

The claims of the current application are directed towards a method of making an *in vitro* assessment of the inherent potential of the seed yield as an indication of the agronomical fitness of a plant, by comparison of the electron flow in the mitochondrial electron transport chain in a stressed explant of the plant line of interest, with the electron flow in the mitochondrial electron transport chain in stressed explants of a control line. This allows to make an estimation whether the plant line of interest has a higher, similar, or worse agronomical fitness (i.e. the inherent potential of that plant line to yield seed) than the control line. The higher the electron flux in the stressed explants, the fitter the plant.

Applicant respectfully submits that the combination of cited references would not have lead a person of ordinary skill in the art to the currently claimed method.

The Examiner's rejection hinges on the alleged teaching by the primary reference (Flavell et al.) that "increased mitochondrial activity accurately reflects increased grain yield." It is true that the abstract of the document states that "Both ratios [measuring mitochondrial activity] were highly correlated with average grain yield". However, a person skilled in the art would certainly not have stopped at reading the abstract, and would have turned to the actual technical teaching in the document. In doing so, he would certainly have noticed the experiments summarized in Table 4 (page 1328) determining the mitochondrial ADP/O and RC ratios in shoots from seeds of Maris Freeman (an average yield wheat variety) with different weights and nitrogen contents. From a comparison of certain ratios mentioned in Table 4 with a certain ratio's mentioned in Table 1, it will be apparent that under particular conditions (e.g. low nitrogen, large seed) the ratios for the average yielding variety are higher than for the highest yielding variety.

This has not passed unnoticed to the authors of the paper themselves. See e.g. page 1328, first paragraph of the discussion:

"However, the variation of the ADP/O and RC ratios in shoot mitochondria from seeds of different sizes and nitrogen contents (Table 4) implies that mitochondrial efficiencies are not fixed solely by the genotype but are also ***subject to regulation by the cellular environment and nutritional status of the maturing and germinating seed****. Germination is dependent upon the metabolic systems, including the mitochondria, conserved in the dry seed from the maturation period. The levels of these and their survival during inactivation in the dry seed are genetically* ***and environmentally*** *determined(emphasis added)."*

In other words, Flavell teaches a correlation between the mitochondrial activity and "seed lot vigor", and not between mitochondrial activity and the inherent agronomical fitness of a particular plant line. *Indeed, "the mitochondrial activities during germination are determined in part by metabolism in the seed which reflects the total carbohydrate deposited in seed, i.e. the metabolic activity of the plant, during seed maturation (page 1329, 2nd paragraph)".*

Thus, measurement of mitochondrial activities in seedlings as taught by Flavell is not an accurate tool to determine inherent yield potential of a plant line with a genotype of interest, as this activity is genetically and environmentally determined. Variation in different seedlings

or plants grown from seed lots with different vigor, e.g. due to environmentally different situations wherein the seed-setting plants have been grown, heavily compromise the predicting value of the yield assessment method described by Flavell. Flavell et al. do not suggest to use stressed explants as a solution for the "deficiency" attached to their method of assessing yield potential.

In contrast, the currently claimed method wherein the electron flow in the mitochondrial electron transport chain in stressed explants is determined, is not significantly influenced by quality of the seedlot. Activities measured in Brassica napus according to the claimed method were essentially similar whether a good seedlot (vigor score of 100%) or a worse seedlot (vigor scores of 51% or 63%) were used to obtain the stressed explants to be measured.

The wrongly characterized teaching of the primary reference used by the Examiner to build her *prima facie* case of obviousness, should already be sufficient to traverse the rejection. Nevertheless, Applicant submits that the secondary references do not cure the deficiencies of the primary reference.

The Examiner has correctly characterized Taylor et al, as teaching that the total respiration rate of a plant is the sum of its maintenance respiration rate and its growth respiration

rate and as hypothesizing that plants that allocate a greater portion of their total respiratory output to growth may be more stress tolerant (office action at page 2). However, this is not tantamount to the Examiner's conclusion at page 3, 3rd paragraph that Taylor taught at the time the invention was made that stress tolerant plants exhibit higher growth rates.

Indeed, the statement at the end of page 608, 2nd column that "genotypes which allocate a greater portion of total respiratory energy to growth would be more stress resistant" only refers to the amount of respiratory energy allocated to growth process **relative** to the respiratory energy allocated to maintenance processes and not to a higher **absolute** amount of total respiratory energy devoted to growth processes. As already indicated in the last sentence of the abstract, plants adaptive to stressful environments have a **low inherent growth rate** and small stature. The two hypotheses may be integrated as explained on page 609, by taking into account that a plant which devotes a large portion of total respiratory energy to growth need not have a high R_{max} (dry matter production) if it maintains a low photosynthetic rate. Thus, rather than teaching that stress tolerant plants exhibit a higher growth rate, Taylor teaches that stress tolerant plants exhibit a lower growth rate.

Even more importantly, Taylor's teaching is confined to formulating a hypothesis relating stress tolerance and the allocation of respiratory energy in plants, in general. Taylor does not teach any correlation at all between the inherent seed yield potential of a plant genotype and it's tolerance to stress, in comparison to less stress tolerant plants. Certainly, Taylor et al. do not teach or suggest that the environmental factor determining the mitochondrial activity as taught by Flavell et al. could be filtered out by imposing stress conditions on explants of the plant material whose agronomical fitness is to be assessed.

Cumming et al. teach that aluminium tolerance in an aluminium-tolerant cultivar of Phaseolus vulgaris (*Dade*) is inducible, and that when *Dade* is exposed to aluminium, root elongation initially is inhibited and then gradually resumed within a 72hr period. This resumption of growth is accompanied by increased rates of root respiration. No such resumption of root elongation can be observed in *Romana*, a aluminium sensitive cultivar. Consequently, the root respiration is not increased.

Importantly, Cumming et al. remain totally silent of the seed yield potential of these cultivars and do not indicate whether *Dade* has a higher inherent seed yield potential than *Romano*, or the reverse.

Again, Cumming et al certainly do not teach or suggest that the environmental factor determining the mitochondrial activity as taught by Flavell et al. could be filtered out by imposing stress conditions on explants of the plant material whose agronomical fitness is to be assessed.

The rest of the secondary references have only been cited to provide teaching for specific stressors, but remain totally silent on the correlation between mitochondrial acitivity and inherent seed yield potential.

Moreover, assuming *arguendo* that a person skilled in the art would have modified the teaching of Flavell et al, as indicated by the Examiner, at best, that person would have arrived at a method wherein mitochondrial activities are estimated in **seedlings** or **plants** grown under stress conditions. However, the currently claimed method explicitly requires measuring the electron flow in the mitochondrial electron transport chain in an **explant** cultivated under stress conditions.

None of the documents teach or suggest that the alleged correlation between mitochondrial activities and seed yield as observed by Flavell et al. for wheat seedlings, would still hold true for explants (whether or not cultivated under stress conditions), nor would a person skilled in the art have a reasonable expectation to obtain such results. Certainly, the

person skilled in the art would not have been in the position to predict that such a method would be better in predicting the inherent seed yield potential of a particular genotype, as it would not be effected by the environmental differences under which the seeds had been growing, in contrast to the method by Flavell et al.

Thus, in view of the above argument, withdrawal of the rejection is respectfully requested.

From the foregoing, reasonable action in the form of a Notice of Allowance is respectfully requested and earnestly solicited.

Pursuant to 37 C.F.R. §§1.17 and 1.136(a), Applicant respectfully petitions for a two (2) month extension of time for filing a reply in connection with the present application, and the required fee of $410.00 is attached hereto.

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact MaryAnne Armstrong, Ph.D. (Reg. No. 40,069) at the telephone number listed below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any

additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly extension of time fees.

Respectfully submitted,

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